

In the Claims

This listing of claims will replace all prior versions, and listings, of claims in the application:

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1. (Currently Amended) A surface treated copper foil for a printed circuit board ~~produced from~~ comprising a copper foil having a first side and a second side with one of said sides roughened,

wherein the copper foil

is a surface treated copper foil, ~~for processing for laser hole formation~~

and

is provided with a nickel layer with of a thickness of 0.08 to 2.0  $\mu\text{m}$  as an additional metal layer ~~in one~~ on said first side but not on said second side, and

~~subjected to a~~ has nodules of nodular treatment by fine copper particles in another on said second side.

2. (Currently Amended) A surface treated copper foil for a printed circuit board ~~produced from~~ comprising a copper foil having a first side and a second side with one of said sides roughened,

wherein the copper foil

is a surface treated copper foil, ~~for processing for laser hole formation~~

and

is provided with a cobalt layer ~~with~~ of a thickness of 0.05 to 3.0  $\mu\text{m}$  as an additional metal layer ~~in one~~ on said first side and

~~subjected to a nodular treatment by~~ has nodules of fine copper particles in ~~another~~ on said second side.

3. (Currently Amended) A surface treated copper foil for a printed circuit board ~~produced from~~ comprising an electrodeposited copper foil ~~obtained by electrolysis in a copper electrolytic solution and subjected to nodular treatment in one side~~ having a matte side and a shiny side, wherein the copper foil

is a surface treated copper foil ~~for processing for laser hole formation and~~  
~~is~~ provided with a nickel layer ~~with~~ of a thickness of 0.05 to 2.0  $\mu\text{m}$  as an additional metal layer ~~in a~~ on the matte side of the electrodeposited copper foil and ~~subjected to a nodular treatment by~~ nodules of fine copper particles ~~in a~~ on the shiny side.

4. (Currently Amended) A surface treated copper foil for a printed circuit board ~~produced from~~ comprising an electrodeposited copper foil ~~obtained by electrolysis in a copper electrolytic solution and subjected to nodular treatment in one side~~ having a matte side and a shiny side, wherein the copper foil

is a surface treated copper foil for processing for laser hole formation and  
~~is~~ provided with a cobalt layer ~~with~~ of a thickness of 0.03 to 3.0  $\mu\text{m}$  as an additional metal layer ~~in a~~ on the matte side of the electrodeposited copper foil and

~~subjected to a nodular treatment by nodules of fine copper particles in a~~ on the shiny  
side.

5. (Currently Amended) An electrodeposited copper foil ~~with carrier~~ assembly  
suitable for having laser holes formed therein, having comprising a three-layer structure  
~~composed of~~ comprising

a carrier foil layer,

an additional metal layer, and

an electrodeposited copper foil layer; wherein a

the carrier foil layer is of a metal material having a smooth surface with a  
roughness (Rz) of 0.05 to less than 4.0  $\mu\text{m}$ ,

the additional metal layer is a nickel layer ~~with~~ of a thickness of 0.08 to 2.0  $\mu\text{m}$   
~~thickness formed in on~~ the smooth surface ~~side~~ of the carrier foil, and

the electrodeposited copper foil layer ~~composed of~~ comprises a bulk layer and  
fine copper particles is ~~formed in on~~ a surface of the additional metal layer ~~to be an~~  
~~electrodeposited copper foil with carrier for processing for laser hole formation.~~

6. (Currently Amended) An electrodeposited copper foil ~~with carrier having~~  
assembly suitable for having laser holes formed therein, comprising a three-layer  
structure ~~composed of~~ comprising

a carrier foil layer,

an additional metal layer, and  
an electrodeposited copper foil layer; wherein  
a the carrier foil layer is of a metal material having a smooth surface with a roughness (Rz) of 0.05 to less than 4.0  $\mu\text{m}$ ,  
the additional metal layer is a cobalt layer with a thickness of 0.05 to 3.0  $\mu\text{m}$  ~~thickness~~  
~~formed in~~ on the smooth surface ~~side~~ of the carrier foil,  
and the electrodeposited copper foil layer ~~composed of~~ comprising a bulk layer and fine copper particles is ~~formed in~~ on a surface of the additional metal layer ~~to be an electrodeposited copper foil with carrier for processing for laser hole formation.~~

7. (Currently Amended) An electrodeposited copper foil ~~with carrier assembly~~ suitable for having laser holes formed therein, comprising a three-layer structure ~~composed of~~ comprising

a carrier foil layer,  
an additional metal layer, and  
an electrodeposited copper foil layer, wherein  
a the carrier foil layer is of a metal material having a smooth surface with a roughness (Rz) of 0.05 to less than 4.0  $\mu\text{m}$ ,  
the additional metal layer is a nickel layer or a cobalt layer with a thickness of 0.03 to 1.0  $\mu\text{m}$  ~~thickness formed in~~ on the smooth surface side of the carrier foil, and  
the electrodeposited copper foil layer comprising only fine copper particles is ~~formed in~~ on a surface of the additional metal layer ~~to be an electrodeposited copper foil with~~

carrier for processing for laser hole formation.

8. (Currently Amended) An electrodeposited copper foil ~~with carrier having~~  
assembly suitable for having laser holes formed therein, comprising a three-layer  
structure ~~composed of~~ comprising

a carrier foil layer,

an additional metal layer, and

an electrodeposited copper foil layer; wherein

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a the carrier foil layer is of a metal material having a matte side with a roughness  
(Rz) of 4.0 to 20.0  $\mu\text{m}$ ,

the additional metal layer is a nickel layer with a thickness of 0.05 to 2.0  $\mu\text{m}$   
~~thickness formed in a~~ on the matte side of the carrier foil layer, and the electrodeposited  
copper foil layer ~~composed of~~ comprising a bulk layer and fine copper particles is  
~~formed in~~ on a surface of the additional metal layer ~~to be an electrodeposited copper~~  
~~foil with carrier for processing for laser hole formation.~~

9. (Currently Amended) An electrodeposited copper foil ~~with carrier having~~  
assembly suitable for having laser holes formed therein, comprising a three-layer  
structure ~~composed of~~ comprising

a carrier foil layer,

an additional metal layer, and

an electrodeposited copper foil layer; wherein  
a the carrier foil is of a metal material having a matte side with a roughness (Rz) of 4.0 to 20.0  $\mu\text{m}$ ,  
the additional metal layer is a cobalt layer with a thickness of 0.03 to 3.0  $\mu\text{m}$  thickness  
~~formed in~~ on the matte side of the carrier foil, and  
the electrodeposited copper foil layer ~~composed of~~ comprising a bulk layer and fine copper particles ~~is formed in~~ on a surface of the additional metal layer ~~to be an electrodeposited copper foil with carrier for processing for laser hole formation.~~

10. (Currently Amended) An electrodeposited copper foil ~~with carrier having~~  
assembly suitable for having laser holes formed therein, comprising a three-layer structure ~~composed of~~ comprising

a carrier foil layer,

an additional metal layer, and

an electrodeposited copper foil layer; wherein

a the carrier foil is of a metal material having a matte side with a roughness (Rz) of 4.0 to 20.0  $\mu\text{m}$ ,

the additional metal layer is a nickel layer or a cobalt layer with a thickness of 0.03 to 1.0  $\mu\text{m}$  thickness ~~formed in~~ on the matte side of the carrier foil, and

the electrodeposited copper foil layer comprising only fine copper particles is ~~formed in~~ on a surface of the additional metal layer ~~to be an electrodeposited copper foil with carrier for processing for laser hole formation.~~

11. (Currently Amended) An electrodeposited copper foil ~~with carrier composed of~~  
assembly suitable for having laser holes formed therein, comprising

a carrier foil,

a release layer ~~formed~~ on a surface of ~~a~~ the carrier foil ~~and,~~

an additional metal layer and an electrodeposited copper foil layer ~~formed~~ on the  
release layer, wherein

the carrier foil is of a film or a metal material having a smooth surface with a  
roughness (Rz) of 0.05 to less than 4.0  $\mu\text{m}$ ,

the release layer ~~is formed using~~ comprising an organic agent or a metal material  
is on the smooth surface ~~side~~ of the carrier foil,

the additional metal layer is a nickel layer with a thickness of 0.08 to 2.0  $\mu\text{m}$   
~~thickness is formed as the additional metal layer~~ on a surface of the release layer, and  
the electrodeposited copper foil layer comprising a bulk layer and fine copper particles  
is ~~formed in~~ on a surface of the additional metal layer ~~to be an electrodeposited copper~~  
~~foil with carrier for processing for laser hole formation.~~

12. (Currently Amended) An electrodeposited copper foil ~~with carrier composed of~~  
assembly suitable for having laser holes formed therein, comprising

a carrier foil,

a release layer ~~formed~~ on the surface of a carrier foil ~~and,~~

an additional metal layer and

an electrodeposited copper foil layer ~~formed~~ on the release layer, wherein the carrier foil is of a film or a metal material having a smooth surface with a roughness (Rz) of 0.05 to less than 4.0  $\mu\text{m}$ , the release layer ~~is formed using~~ comprises an organic agent or a metal material on the smooth face side of the carrier foil, the additional metal layer is a cobalt layer with a thickness of 0.05 to 3.0  $\mu\text{m}$  thickness ~~is formed as the additional metal layer~~ on a surface of the release layer, and the electrodeposited copper foil layer comprising a bulk layer and fine copper particles is ~~formed in~~ on a surface of the additional metal layer ~~to be an electrodeposited copper foil with carrier for processing for laser hole formation.~~

13. (Currently Amended) An electrodeposited copper foil ~~with carrier composed of~~ assembly suitable for having laser holes formed therein, comprising  
a carrier foil,  
a release layer ~~formed on~~ a surface of a the carrier foil ~~and,~~  
an additional metal layer and an electrodeposited copper foil layer ~~formed~~ on the release layer, wherein  
the carrier foil is of a film or a metal material having a smooth surface with a roughness (Rz) of 0.05 to less than 4.0  $\mu\text{m}$ ,  
the release layer ~~is formed using~~ comprises an organic agent or a metal material on the smooth surface ~~side~~ of the carrier foil,

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the additional metal layer is a nickel layer or a cobalt layer with a thickness of 0.03 to 1.0  $\mu\text{m}$  thickness is formed as the additional metal layer on the surface of the release layer, and

the electrodeposited copper foil layer comprising only fine copper particles is ~~formed in~~ on the surface of the additional metal layer ~~to be an electrodeposited copper foil with carrier for processing for laser hole formation.~~

14. (Currently Amended) An electrodeposited copper foil ~~with carrier composed of~~ assembly suitable for having laser holes formed therein, comprising

a carrier foil,

a release layer ~~formed~~ on a surface of ~~a~~ the carrier foil ~~and,~~

an additional metal layer and

an electrodeposited copper foil layer ~~formed~~ on the release layer, wherein

the carrier foil is of a film or a metal material having a roughened face with a roughness (Rz) of 4.0 to 20.0  $\mu\text{m}$ ,

the release layer ~~is formed using~~ comprises an organic agent or a metal material on the roughened surface ~~side~~ of the carrier foil,

the additional metal layer is a nickel layer with a thickness of 0.05 to 2.0  $\mu\text{m}$  thickness is formed as the additional metal layer on a surface of the release layer, and the electrodeposited copper foil layer comprising a bulk layer and fine copper particles is ~~formed in~~ on the surface of the additional metal layer ~~to be an electrodeposited~~

~~copper foil with carrier for processing for laser hole formation.~~

15. (Currently Amended) An electrodeposited copper foil ~~with carrier composed of~~  
assembly suitable for having laser holes formed therein, comprising

a carrier foil,

a release layer ~~formed~~ on a surface of ~~a~~ the carrier foil and,

an additional metal layer and

an electrodeposited copper foil layer formed on the release layer, wherein

the carrier foil is of a film or a metal material having a roughened face with a roughness  
(Rz) of 4.0 to 20.0  $\mu\text{m}$ ,

the release layer ~~is formed using~~ comprises an organic agent or a metal material on the  
roughened face side of the carrier foil,

the additional metal layer is a cobalt layer with a thickness of 0.03 to 3.0  $\mu\text{m}$  ~~is formed~~  
~~as the additional metal layer~~ on a surface of the release layer, and

the electrodeposited copper foil layer comprising a bulk layer and fine copper particles  
is formed ~~in~~ on a surface of the additional metal layer ~~to be an electrodeposited copper~~  
~~foil with carrier for processing for laser hole formation.~~

16. (Currently Amended) An electrodeposited copper foil ~~with carrier composed of~~  
assembly suitable for having laser holes formed therein, comprising

a carrier foil,

a release layer ~~formed on a~~ the surface of a carrier foil and

an electrodeposited copper foil layer formed on the release layer,  
wherein the carrier foil is of a film or a metal material having a roughened face with a roughness (Rz) of 4.0 to 20.0  $\mu\text{m}$ ,  
the release layer ~~is formed using~~ comprises an organic agent or a metal material on the roughened face side of the carrier foil,  
the additional metal layer is a nickel layer or a cobalt layer with a thickness of 0.03 to 1.0  $\mu\text{m}$  ~~thickness is formed as the additional metal layer~~ on a surface of the release layer, and  
the electrodeposited copper foil layer comprising only fine copper particles is ~~formed in~~ on a surface of the additional metal layer ~~to be an electrodeposited copper foil with carrier for processing for laser hole formation.~~

17. (Previously presented) The electrodeposited copper foil with carrier for processing for laser hole formation as claimed in claim 11, wherein the organic agent to be employed for the release layer is one or more compounds selected from nitrogen-containing organic compounds, sulfur-containing organic compounds, and carboxylic acids.

18. (Currently Amended) The electrodeposited copper foil with carrier for processing for laser hole formation as claimed in claim 11, wherein the release layer is formed by applying one of organic agent or a mixture of two or more organic agents selected from nitrogen-containing organic compounds, sulfur-containing organic compounds, and

carboxylic acids repeatedly a plurality of times.

19. (Previously presented) The electrodeposited copper foil with carrier for processing for laser hole formation as claimed in claim 11, wherein the release layer is formed by reciprocally and repeatedly applying two or more organic agents selected from nitrogen-containing organic compounds, sulfur-containing organic compounds, and carboxylic acids.

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20. (Previously presented) The electrodeposited copper foil with carrier for processing for laser hole formation as claimed in claim 11, wherein the release layer is of an organic film with a thickness of 1 nm to 1  $\mu\text{m}$ .

21. (Previously presented) The electrodeposited copper foil with carrier as claimed in claim 5, wherein the carrier foil is an electrodeposited copper foil having a matte side with a roughness (Rz) of 0.05  $\mu\text{m}$  to less than 4.0  $\mu\text{m}$ .

22. (Previously presented) The electrodeposited copper foil with carrier for processing for laser hole formation as claimed in claim 8, wherein the carrier foil is an electrodeposited copper foil having a matte side with a roughness (Rz) of 4.0  $\mu\text{m}$  to 20.0  $\mu\text{m}$ .

23. (Withdrawn) A manufacturing method for an electrodeposited copper foil with

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carrier comprising steps of unwinding a carrier foil rolled in a roll state in one direction and subjecting the carrier foil to electrodeposited copper foil layer formation processes properly equipped with water-rinsing treatment tanks by passing the carrier foil respectively through an pickling tank, a release layer formation tank using an organic agent, a formation tank for forming a bulk copper layer to be the electrodeposited copper foil layer, a surface nodular treatment tank for forming fine copper particles on a surface of the bulk copper layer, an anti-corrosion treatment tank, and a drying part to continuously form the release layer of the organic agent and the electrodeposited copper foil layer on the carrier foil.

24. (Previously presented) A copper clad laminate obtained using the surface treated copper foil for processing for laser hole formation as claimed in claim 1.

25. (Previously presented) A copper clad laminate obtained using the electrodeposited copper foil with carrier for processing for laser hole formation as claimed in claim 5.

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26. (New) In a method for forming a hole in a printed circuit board using a laser, comprising

providing a copper foil, and burning a hole in the copper foil by use of the laser,

the improvement comprising

forming said holes without the need of prior etching of said copper foil, by

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providing a copper foil of a printed circuit board having a nickel layer on one side and  
nodules of fine copper particles on the other side.

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